PB-218 878

EXHAUST EMISSIONS FROM A PASSENGER CAR EQUIPPED WITH DUPONT EXHAUST EMISSION CONTROL SYSTEM USING 1975 TEST PROCEDURE

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Ann Arbor, Michigan

August 1970

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71-3

APTD-1438

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Division of Motor Vehicle Research and Development
National Air Pollution Control Administration
Department of Health, Education, and Welfare

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BIBLIOGRAPHIC DATA SHEET	1. Report No. APTD-1438	2.	3. Recipient's Accession No. PB-218 878
4. Title and Subtitle Exhaust Emissions from a Passenger Car Equipped with a DuPont Exhaust Emission Control System Using 1975 Test Procedure			5. Report Date August 1970 6.
7. Author(s) John C. Thomson			8. Performing Organization Rept. No.
9. Performing Organization Name and Address Department of Health, Education, and Welfare National Air Pollution Control Administration Division of Motor Vehicle Research and Development Ann Arbor, Michigan			10. Project/Task/Work Unit No. 11. Contract/Grant No.
12. Sponsoring Organization Name and Address Same			13. Type of Report & Period Covered Inhouse 14.

15. Supplementary Notes

16. Abstracts
The exhaust emission characteristics of a vehicle equipped with a DuPont exhaust emission control system were measured to provide a comparison with other low emission vehicles having the potential for meeting proposed 1975 Federal standards. The vehicle used for testing was a 1970 Chevrolet equipped with DuPont's latest reactor system. This was a typical vehicle with the following modifications: exhaust manifold reactor; exhaust gas recirculation, manifold air injection; particulate traps with special exhaust system; and carburetor modifications. The following tests were conducted: (1) standard 1970 Federal test procedure for exhaust emissions; (2) a closed, constant volume sampling technique using 9 repeats of the Federal emissions test cycle (CVS); (3) a closed, constant volume sampling technique using the new LA4-S3 driving schedule as specified for 1972 and later testing; (4) an experimental particulate test using the hot start LA4-S3 procedure. Samples were analyzed for carbon monoxide, carbon dioxide, hydrocarbons, nitrogen oxides, and particulates. Conclusions arrived at were as follows: (1) the DuPont exhaust emission control system greatly reduces unburned hydrocarbons; (2) the DuPont system reduces oxides of nitrogen; (3) very little effect is shown on carbon monoxide compared with standard production vehicles.

17. Key Words and Document Analysis. 17a. Descriptors

Air pollution
Automobiles
Exhaust emissions
Tests
Particles
Carbon monoxide
Carbon dioxide
Hydrocarbons
Nitrogen oxides
Air pollution control equipment

17b. Identifiers/Open-Ended Terms

DuPont emission control device
1970 Federal Test Procedure (FTP)
Constant Volume Sampling (CVS)
LA4-S3 driving schedule
Particulates

17c. COSATI Field/Group 13B

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
Unlimited	UNCLASSIFIED	6
	20. Security Class (This Page) UNCLASSIFIED	22. Price

Vehicles Tested

The exhaust emission characteristics of a vehicle equipped with a DuPont exhaust emission control system were measured to provide a comparison with other low emission vehicles having the potential for meeting proposed 1975 Federal standards. This was a repeat test with special emphasis on procedures to be used for 1975 vehicle testing.

To obtain emission data, DuPont delivered for test a 1970 Chevrolet equipped with their latest reactor system. This was a typical vehicle with the following modifications: exhaust manifold reactor, exhaust gas recirculation, manifold air injection, particulate traps with special exhaust systems, and carburetor modifications. The vehicle used a 350 cubic inch engine with automatic transmission. All tests were run using Indolene 30 fuel. This was the same vehicle tested in May 1970 with minor adjustments in carburetor and assembly of the reactor.

Tests Used

The following tests were conducted:

1. Standard 1970 Federal test procedure for exhaust emissions.

2. A closed, constant volume sampling technique using 9 repeats of the Federal emissions test cycle (CVS).

3. A closed, constant volume sampling technique using the new LA4-S3 driving schedule as specified for 1972 and later testing.

4. An experimental particulate test using the hot start LA4-S3 procedure.

Emission values were obtained both on a concentration basis and on a mass basis.

Closed cycle data were taken using a constant volume sampling technique. Bag samples were analyzed using non-dispersive infrared analyzers for carbon monoxide and carbon dioxide with hydrocarbons measured using a flame ionization detector. The modified Saltzman wet chemical method was used to determine oxides of nitrogen. Particulates were measured using a multiplate condenser followed by high efficiency filters.

Emission Results

The data shown in Table I compare tests run on the DuPont automobile in April and July with the average of six similar 1970 passenger cars tested and with the best of the six. This testing method utilizes a continuous sample of the exhaust products throughout the entire test. The DuPont vehicle still

shows excellent control over hydrocarbons and oxides of nitrogen but only minimal control over carbon monoxide. Table 2 summarizes the tests run and results obtained in the latest series.

No attempt was made to evaluate driveability or fuel economy. The vehicle was turned over to DuPont at the conclusion of testing. Some problems were found in May by DuPont in the bypass system that allowed some exhaust to circumvent the reactor; the effect of this problem on emissions is not known but it is suspected to be minimal as shown by the June results on the corrected vehicle. Some problems in the carburetor were also corrected prior to the tests.

Particulate emissions using a technique described in Volume 27, Jan-Feb 1966, American Industrial Hygiene Association Journal, P. 47 were measured. As no definition of particulates has been adopted to conform to the standards for 1975 the data presented in Table 2 should not be interpreted as being either above or below the proposed particulate standard.

Conclusions

1. The DuPont exhaust emission control system greatly reduces unburned hydrocarbons.

2. The DuPont system reduces oxides of nitrogen.

3. Very little effect is shown on carbon monoxide compared with standard production vehicles.

Table 1

Cold 9 cycle CVS Data

	DuPont Reactor 1970 Chevy 350		Average of 6 1970 Chevy 350	Best of 6
	May 1970	June 1970		
HC	0.70	0.49	3.07	2.23
CO	24.34	17.14	37.35	22.35
NO_x*	1.29	0.95	3.24	2.29

*NO_x data from Whittaker "NO_x Box", an electro-chemical oxides of nitrogen analyzer.

Table 2

Results of Tests*

June 30, 1970 — LA4-S3 CVS

Cold LA4-S3
HC = 0.79 gm/mi
CO = 25.92 gm/mi
NO_x = 1.03 gm/mi

June 30, 1970 — LA4-S3 CVS

Cold LA4-S3
HC = 0.44 gm/mi
CO = 20.82 gm/mi
NO_x = 0.99 gm/mi

July 1, 1970 — Federal Test and 9 CVS

Cold 1970 Federal Procedure
HC = 0.24 gm/mi
CO = 11.3 gm/mi
NO_x = 0.44 gm/mi

Cold 9 CVS
HC = 0.49 gm/mi
CO = 17.14 gm/mi
NO_x = 0.95 gm/mi

July 2, 1970 — Hot Start LA4-S3 Particulate

Particulates = .44 gm/mi

*Federal Test is the 1970 Federal Emissions test procedure from a cold start.

9-CVS is a closed cycle using 9 repeats of the Federal emission test cycle with constant volume sampling and cold start.

LA4-S3 CVS is the proposed 1972 Federal Test procedure using a cold start.